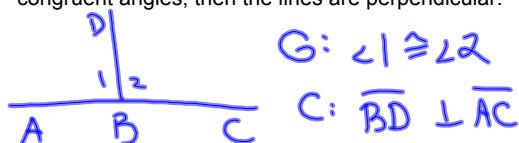


## 3.6 Prove Theorems about Perpendicular Lines

## Notes

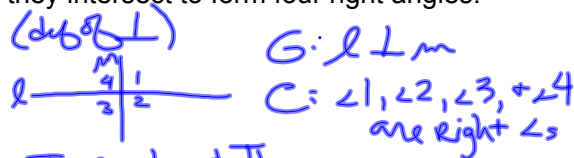
Several theorems about perpendicular lines

Theorem 3.8—If 2 lines intersect to form a linear pair of congruent angles, then the lines are perpendicular.



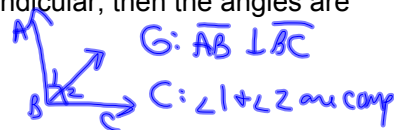
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Theorem 3.9—If 2 lines are perpendicular, then they intersect to form four right angles.



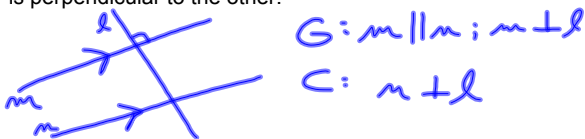
The Complement Theorem

Theorem 3.10—If 2 sides of 2 adjacent acute angles are perpendicular, then the angles are complementary.

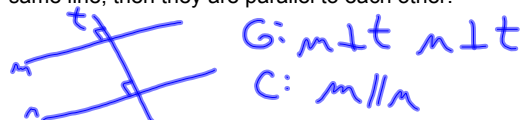


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Theorem 3.11—Perpendicular Transversal Theorem—If a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other.



Theorem 3.12—Lines Perpendicular to a Transversal Theorem—In a plane, if two lines are perpendicular to the same line, then they are parallel to each other.



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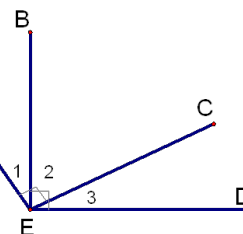
Example:

Given:  $\overline{AE} \perp \overline{EC}; \overline{BE} \perp \overline{ED}$

Prove:  $\angle 1 \cong \angle 3$

Statements Reasons

- |  |                      |
|--|----------------------|
| ① $\sim$   | ① Given              |
| ② $\angle 2 + \angle 3$ are compl<br>$\angle 1 + \angle 2$ are compl | ② The Compl. Thm     |
| ③ $\angle 1 \cong \angle 3$  | ③ $\cong$ Compl. thm |

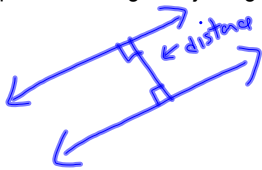


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Distance from a point to a line—the length of the perpendicular segment from the point to the line.



The distance between 2 parallel lines is the length of any perpendicular segment joining the 2 lines.



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Examples:

Find the distance between the point and the line listed.

Ex 1:  $(-6, 1)$  and  $y = -2x + 4$

- ① Sketch
- ② Where does  $\perp$  segment intersect the line?

③ Find Eqn of  $\perp$  line  
 $y = \frac{1}{2}x + b$   
 $1 = \frac{1}{2}(-6) + b$   
 $4 = b$

- ④ Solve system of eqs.  
 $(0, 4)$

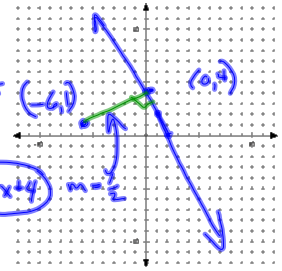
- ⑤ Find distance b/w  $(-6, 1)$  and  $(0, 4)$

$$d = \sqrt{(-6-0)^2 + (1-4)^2}$$

$$d = \sqrt{36 + 9}$$

$$d = \sqrt{45} = 3\sqrt{5} \text{ units}$$

$$d \approx 6.71 \text{ units}$$



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Ex 2:  $(3, 0)$  and

$$y = \frac{2}{3}x + 4$$

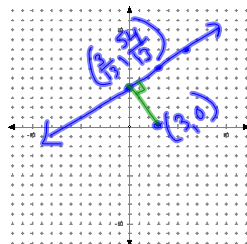
$$y = -\frac{3}{2}x + b$$

$$0 = -\frac{3}{2}(3) + b$$

$$\frac{9}{2} = b$$

$$y = -\frac{3}{2}x + \frac{9}{2}$$

$$y = \frac{2}{3}x + 4$$



$$6\left[-\frac{3}{2}x + \frac{9}{2} = \frac{2}{3}x + 4\right]$$

$$-9x + 27 = 4x + 24$$

$$\left(\frac{3}{13}, \frac{54}{13}\right) \quad \frac{3}{13} = x \quad y = \frac{54}{13}$$

$$d = \sqrt{\left(3 - \frac{3}{13}\right)^2 + \left(0 - \frac{54}{13}\right)^2}$$

$$d = \sqrt{7.669 + 17.254}$$

$$d = \sqrt{24.92}$$

$$d \approx 4.99 \text{ units}$$

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Find the distance between the two parallel lines.

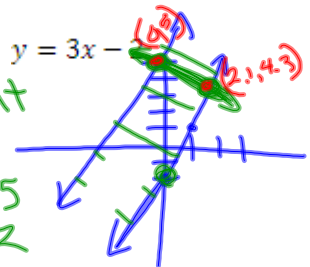
Ex 3:  $y = 3x + 5$  and  $y = 3x - 2$

Choose a y-int to work

$$\begin{cases} y = -\frac{1}{3}x + 5 \\ y = 3x - 2 \end{cases}$$

$$d \approx \sqrt{(6-2)^2 + (5-4)^2}$$

$$d \approx 2.21 \text{ units}$$



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HW p194-195 #s 1-7, 13-17  
and find the distance between

$$y = -2x + 4$$

$$y = -2x - 5$$

~~Test Thursday!~~

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